

**REMARKS**

**I. STATUS OF THE CLAIMS**

Claims 1, 3-4, 6-16, 19-20, 22-23, 25-26 and 32-35 are pending in the present application. Claims 1, 12, 19, and 33 are the independent claims.

Claims 2, 5, 21 and 24 have been cancelled without prejudice to or disclaimer of the subject matter recited therein.

Claims 1, 12, 19 and 33 have been amended. No new matter is believed to have been added.

**II. THE REJECTION OF CLAIMS 1-16, 19-26 AND 32-35 UNDER 35 U.S.C. §112, FIRST PARAGRAPH**

Applicants respectfully traverse this rejection for at least the following reasons.

Claims 2, 5, 21 and 24 have been cancelled without prejudice to or disclaimer of the subject matter recited therein. Accordingly, the rejection of these claims is now moot.

Independent claims 1, 12, 19, and 33 have been amended to correct the minor informalities indicated by the Examiner. Accordingly, Applicants respectfully assert that the rejection of claims 1, 3-4, 6-16, 19-20, 22-23, 25-26 and 32-35 under 35 U.S.C. § 112, first paragraph should be withdrawn.

**III. THE REJECTION OF CLAIMS 1-16, 19-26 AND 32-35 UNDER 35 U.S.C. §112, SECOND PARAGRAPH**

Applicants respectfully traverse this rejection for at least the following reasons.

As noted above, claims 2, 5, 21 and 24 have been cancelled without prejudice to or disclaimer of the subject matter recited therein. Accordingly, the rejection of these claims is now moot.

Independent claims 1, 12, 19, and 33 have been amended to correct the minor informalities indicated by the Examiner. Accordingly, Applicants respectfully assert that the rejection of claims 1, 3-4, 6-16, 19-20, 22-23, 25-26 and 32-35 under 35 U.S.C. § 112, second paragraph should be withdrawn.

IV. THE REJECTION OF CLAIMS 1-16, 19-26, 32 and 33 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER CHU (U.S. PATENT 6,030,720).

Applicants respectfully traverse this rejection for at least the following reasons.

Independent claim 1, as amended, recites amongst other novel features, a lithium-sulfur battery wherein the weak polar solvent is selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and has a dielectric coefficient of less than 15 and the weak polar solvent comprises one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Chu discloses electrolyte solvents for ambient-temperature lithium sulfur batteries, the electrolyte solvents including one or more compounds having an ethanediether linkage such as a glyme (column 12, lines 52-67).

However, Chu fails to teach or suggest using a weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in newly amended independent claim 1.

Accordingly, Applicants respectfully assert that the rejection of claim 1 under 35 U.S.C. § 103(a) should be withdrawn because Chu fails to teach or suggest each feature of independent claim 1, as amended.

Furthermore, Applicants respectfully assert that dependent claims 3-4 and 6-11 are allowable at least because of their dependence from claim 1, and the reasons set forth above.

Independent claim 12, as amended, recites a lithium-sulfur battery comprising mixed organic solvents, wherein a weak polar solvent is selected from the weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether.

As noted above, Chu fails to teach or suggest a weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in newly amended independent claim 12.

Accordingly, Applicants respectfully assert that the rejection of claim 12 under 35 U.S.C. § 103(a) should be withdrawn because Chu fails to teach or suggest each feature of independent claim 12, as amended.

Furthermore, Applicants respectfully assert that dependent claims 13-16 are allowable at least because of their dependence from claim 12, and the reasons set forth above.

Independent claim 19 recites an electrolyte for use in a lithium sulfur battery comprising, amongst other novel elements, a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprises one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Chu fails to teach or suggest this novel feature. Accordingly, Applicants respectfully assert that the rejection of claim 19 under 35 U.S.C. §103(a) should be withdrawn.

Furthermore, Applicants respectfully assert that dependent claims 20, 22-23, 25-26 and 32 are allowable at least because of their dependence from claim 19 and the reasons set forth above.

Independent claim 33 recites a method of manufacturing a lithium-sulfur battery comprising, amongst other novel features, a weak polar solvent selected from a group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Chu discloses electrolyte solvents for ambient-temperature lithium-sulfur batteries. The electrolyte solvents include compounds having an ethanediether linkage or a crown ether (column 12, lines 52-67). However, Chu fails to teach or suggest a weak polar solvent selected from a group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in newly amended independent claim 33.

Accordingly, Applicants respectfully assert that the rejection of claim 33 under 35 U.S.C. §103(a) should be withdrawn.

V. THE REJECTION OF CLAIMS 1-16, 19-26, 32 and 33 UNDER 35 U.S.C. §103(a) AS

BEING UNPATENTABLE OVER NIMON (U.S. PATENT 6,225,002).

Applicants respectfully traverse this rejection for at least the following reasons.

Independent claim 1 recites a lithium-sulfur battery comprising, amongst other novel features, a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15, the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Nimon discloses dioxolane-treated lithium electrodes (abstract). However, Nimon fails to teach or suggest a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15, the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in newly amended independent claim 1.

Accordingly, Applicants respectfully assert that the rejection of claim 1 under 35 U.S.C. § 103(a) should be withdrawn because Nimon fails to teach or suggest each feature of independent claim 1, as amended.

Furthermore, Applicants respectfully assert that dependent claims 3-4 and 6-11 are allowable at least because of their dependence from claim 1, and the reasons set forth above.

Independent claim 12 recites a lithium-sulfur battery, comprising, amongst other novel features, a weak polar solvent selected from the weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether.

As noted above, Nimon discloses dioxolane-treated lithium electrodes (abstract), but fails to teach or fairly suggest a weak polar solvent selected from the weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether.

Accordingly, Applicants respectfully assert that the rejection of claim 12 under 35 U.S.C. § 103(a) should be withdrawn because Nimon fails to teach or suggest each feature of independent claim 12, as amended.

Furthermore, Applicants respectfully assert that dependent claims 13-16 are allowable at

least because of their dependence from claim 12, and the reasons set forth above.

Independent claim 19 recites an electrolyte for use in a lithium sulfur battery comprising, amongst other novel features, a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

As noted above, Nimon discloses dioxolane-treated lithium electrodes (abstract), but fails to teach or fairly suggest the features of newly amended independent claim 19.

Accordingly, Applicants respectfully assert that the rejection of claim 19 under 35 U.S.C. §103(a) should be withdrawn.

Furthermore, Applicants respectfully assert that dependent claims 20, 22-23, 25-26 and 32 are allowable at least because of their dependence from claim 19 and the reasons set forth above.

Independent claim 33 recites a method of manufacturing a lithium-sulfur battery, comprising, amongst other novel features, a weak polar solvent selected from a group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Nimon fails to teach or suggest the features recited in independent claim 33.

Accordingly, Applicants respectfully assert that the rejection of claim 33 under 35 U.S.C. §103(a) should be withdrawn.

VI. THE REJECTION OF CLAIMS 1-16, 19-26 AND 32-35 UNDER 35 U.S.C. §103(a) AS BEING UNPATENTABLE OVER KATZ (U.S. PATENT 6,358,643).

Applicants respectfully traverse this rejection for at least the following reasons.

Independent claim 1, as amended, recites a lithium-sulfur battery comprising, amongst other novel features, a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected

from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Katz teaches a high performance lithium-sulfur battery cell including a negative electrode, a positive electrode and a liquid catholyte including a solvent (abstract).

Katz fails to teach or fairly suggest a weak polar solvent selected from the group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in amended independent claim 1.

Accordingly, Applicants respectfully assert that the rejection of claim 1 under 35 U.S.C. § 103(a) should be withdrawn because Katz fails to teach or suggest each feature of independent claim 1, as amended.

Furthermore, Applicants respectfully assert that dependent claims 3-4 and 6-11 are allowable at least because of their dependence from claim 1, and the reasons set forth above.

Independent claim 12 recites a lithium-sulfur battery comprising, amongst other novel features, a weak polar solvent selected from the weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether.

As noted above, Katz teaches a high performance lithium-sulfur battery cell including a negative electrode, a positive electrode and a liquid catholyte including a solvent (abstract).

Katz however fails to teach or suggest a weak polar solvent selected from the weak polar solvent group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, toluene, dimethyl ether and diethyl ether, as recited in newly amended independent claim 12.

Accordingly, Applicants respectfully assert that the rejection of claim 12 under 35 U.S.C. § 103(a) should be withdrawn because Katz fails to teach or suggest each feature of independent claim 12, as amended.

Furthermore, Applicants respectfully assert that dependent claims 13-16 are allowable at least because of their dependence from claim 12, and the reasons set forth above.

Independent claim 19 recites an electrolyte for use in a lithium sulfur battery comprising, amongst other novel features, a weak polar solvent selected from the group consisting of aryl

compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Katz fails to teach or suggest the features recited in independent claim 19.

Accordingly, Applicants respectfully assert that the rejection of claim 19 under 35 U.S.C. §103(a) should be withdrawn.

Furthermore, Applicants respectfully assert that dependent claims 20, 22-23, 25-26 and 32 are allowable at least because of their dependence from claim 19 and the reasons set forth above.

Independent claim 33 recites a method of manufacturing a lithium-sulfur battery, comprising, amongst other novel features, a weak polar solvent selected from a group consisting of aryl compounds, cyclic or noncyclic ether compounds, and noncyclic carbonate compounds, and having a dielectric coefficient of less than 15 and the weak polar solvent comprising one solvent selected from the group consisting of xylene, dimethoxyethane, 2-methyltetrahydrofuran, diethyl carbonate, dimethyl carbonate, toluene, dimethyl ether and diethyl ether.

Katz fails to teach or suggest the features recited in independent claim 33.

Accordingly, Applicants respectfully assert that the rejection of claim 33 under 35 U.S.C. §103(a) should be withdrawn.

Furthermore, Applicants respectfully assert that dependent claims 34-35 are allowable at least because of their dependence from claim 33 and the reasons set forth above.

## VII. CONCLUSION

In accordance with the foregoing, it is respectfully submitted that all outstanding rejections have been overcome and/or rendered moot. And further, that all pending claims patentably distinguish over the prior art. Thus, there being no further outstanding rejections, the application is submitted as being in condition for allowance which action is earnestly solicited.

If the Examiner has any remaining issues to be addressed, it is believed that prosecution can be expedited and possibly concluded by the Examiner contacting the undersigned attorney to discuss any such remaining issues.

If there are any additional fees associated with filing of this Amendment, please charge

the same to our Deposit Account No. 503333.

Respectfully submitted,

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Date: 5/17/05

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